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ABSTRACT

An ultra-wide band (UWB) waveform generator and encoder for use in a UWB digital communication system. The UWB waveform is made up of a sequence of shaped wavelets. The waveform generator produces multi-amplitude, multi-phase wavelets that are time-constrained, zero mean, and can be orthogonal in phase, yet still have a -10dB power spectral bandwidth that is larger than the frequency of the peak of the power spectrum. In one embodiment, the wavelets are bi-phase wavelets. The encoder multiplies each data bit by an *n*-bit identifying code, (e.g., a user code), resulting in a group of wavelets corresponding to each data bit. The identifying codeword is passed onto the UWB waveform generator for generation of a UWB waveform that can be transmitted via an antenna.